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High power molten fluoride salt target for 18Ne production

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The isotope pair 6He/18Ne has been suggested as the baseline isotopes for the Beta beams project [1]. The production of these isotopes has been studied within the EURISOL-DS project, where a top-down approach provided the need for the production of about 6x10ˆ13 6He and 1x10ˆ13 18Ne per second which would lead to rates of 2.9x10ˆ19 anti-ve and 1.1x10ˆ19 ve over a running period of 2 and 8 years, respectively [2]. The production of 6He at the required rates was successfully validated using the isotope separation online (ISOL) method exploiting a solid neutron converter at 100-200 kW level [3]. On the other hand, the production of 18Ne using oxide targets was found to be more problematic.
A target unit designed for the production of the required rates of 18Ne for the Beta Beams project is presented. The target material consisted of a binary fluoride system, NaF:LiF (molar ratio 39:61), with melting point at 649ºC. The principle was tested online at CERN/ISOLDE using a static target unit. The production of ISOL beams of Ne were monitored as a function of the target temperature and proton beam intensity. Moreover, other low Z isotopes have been measured and an increase of two orders of magnitude on carbon isotopes has been observed.
The production of 18Ne from the NaF:LiF molten salt target contributes to the validation of a high power molten salt circulating loop, which will allow reaching the required high rates of this isotope for the beta beams. Rates of 10ˆ13 18Ne/s are predicted, exploiting 1 MW, 160 MeV proton beam produced from an upgraded Linac4 at CERN, an useful rate for the foreseen beta beam facility [4]. Moreover, the influence of alternative proton drivers, such as a 250 MeV deuteron beam proposed during EURISOL-DS project [2], in the present design concept is discussed.

References

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